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How Old Is the Earth?

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HOW OLD IS THE EARTH?

by Dr. Larry Helmick and Dr. Donald Baumann

Magazines, newspapers, and even textbooks routinely state, often somewhat dogmatically, that the earth is four-and-a-half billion years old. Usually no specific explanation as to how that age was determined is given, and no alternative views of the data are presented. Yet the age of the earth remains open to scientific debate for several reasons. It is a key factor in understanding origins in general, and it is fundamental to correctly understanding several specific academic disciplines. Furthermore, evidence exists that could lead us to believe that the earth is anywhere from several thousand to several billion years old. But what is really correct? What should we believe?

Scientists who believe that the earth is extremely old often base their conclusion on the observation of certain natural processes such as radioactive decay. For example, rubidium-87 (^{87}Rb) is a common radioactive isotope which decays into stable strontium-87 (^{87}Sr), called radiogenic strontium when it is formed by radioactive decay. Since both rubidium-87 and strontium-87 are often found in igneous rocks (rocks which were once molten) along with normal strontium-86 and nonradiogenic strontium-87, and since the rate of radioactive decay is known, many "old earth" scientists believe that the age of igneous rocks can be calculated from the present concentrations of these isotopes. This is called a radiometric dating method. However, this calculation involves certain rather unlikely assumptions about the initial concentrations of isotopes. Furthermore, these assumptions cannot be verified, and therefore may not even be valid in many cases.

To reduce the likelihood of calculating ages using invalid assumptions, or even invalid data, these scientists sometimes use a graphical method, called the isochron method, to calculate ages. (See DEMONSTRATION sidebar.) If the data forms a straight line (an isochron), it is believed to be valid. The slope of the line is then used to calculate the age of the rock. If the data is scattered, it is assumed to be invalid due to leaching of elements into or out of the rock since its formation, and is therefore ignored.

However, even this method often yields results which are obviously not valid. Our demonstration shows how four contradictory results can be obtained for the same rock! All four cannot be valid. How, then, do scientists determine which result to accept and which to ignore? The answer is not determined by the data or the method of analysis. It is determined primarily by their preconceived ideas. If the result seems to fit what they believe to be true, it is considered valid. If it doesn't, it is considered invalid and ignored.

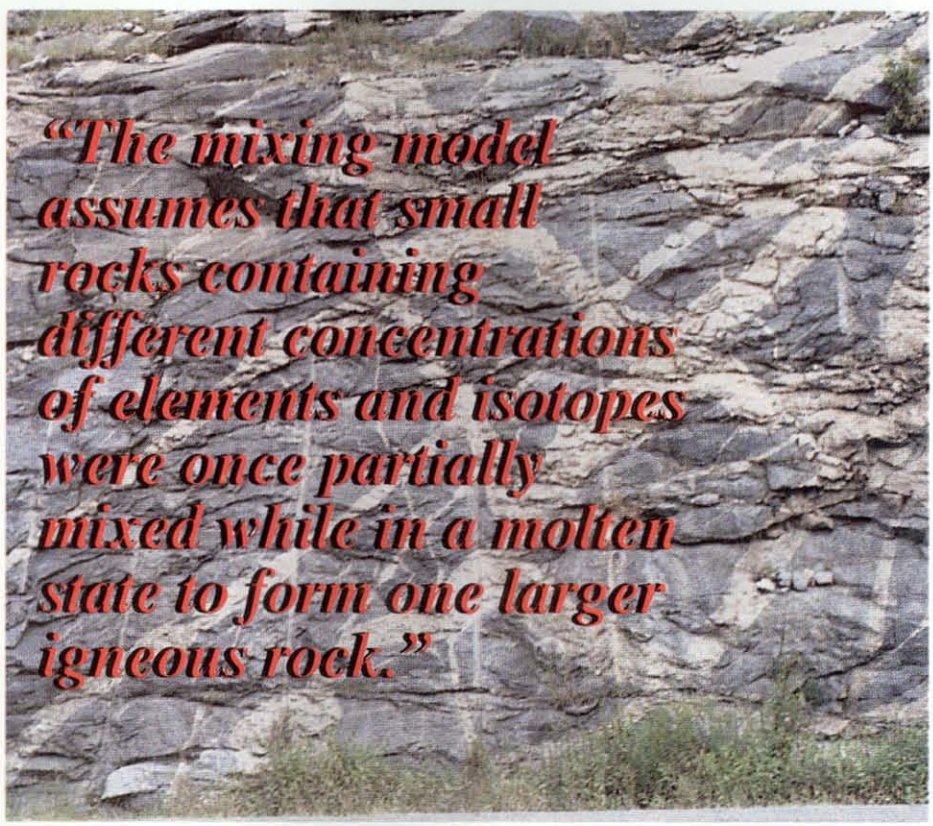
In spite of the serious limitations of this method, it appears convincing and is now accepted by most scientists without question.

Yet there is another simple explanation of the data which is nearly always ignored because it produces nothing interesting or publishable about a rock, such as the age. However, it can account for all the data, not just part of it, and therefore might be considered to be a better explanation of the data. It is known as the mixing model.

The mixing model assumes that small rocks containing different concentrations of elements and isotopes were once partially mixed while in a molten state to form one larger igneous rock. This assumption is consistent with the worldwide observation of large scale catastrophic events, such as volcanoes, which produce molten rock.

If mixing has indeed occurred in a large percentage of igneous rocks, then we would expect to obtain each of the four different types of results occasionally, depending upon which combination of data happened to be obtained and plotted. This is exactly what is found. Therefore, scattered data is not necessarily the result of leaching. It may also be the result of mixing and therefore would still be considered valid. More significantly, it is possible to obtain isochrons due to incomplete mixing of molten rocks, but these isochrons have nothing to do with age. In fact, calculation of an age from the slope of the isochron would clearly be a misinterpretation of the data and would be very misleading! In this case, the data simply represent various ratios of isotopes in the rock and have nothing to do with the age of the rock.

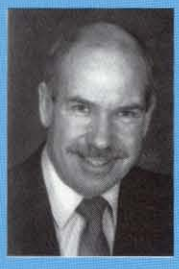
Now, is it possible to determine which of the two possible explanations for formation of isochrons, aging or mixing, is correct? Fortunately, yes! Through a simple mathematical analysis, it is possible to determine in most cases if mixing has indeed occurred. Examination of 18 isochrons published in the scientific literature indicates that 72% appear to be the



result of mixing, not aging. The remaining 28% could be the result of either mixing or aging. Thus it is clear that, in many cases, erroneous ages have been calculated from isochrons that are actually the result of mixing, not aging.

The mixing model demonstrates that the ratios of elements and isotopes in igneous rocks are usually the result of incomplete mixing of different rocks while in a molten state, not the result of aging. Thus the radiometric method cannot be used to date rocks or determine the age of the earth. Claims that the earth is four and a half billion years old, based upon radiometric dating, are clearly unwarranted. In fact, the earth could be very young, as the Bible seems to indicate. Since science cannot determine absolute truth, we must look to other sources to determine truth concerning origins and to filter the conclusions that are obtained from scientific investigations. Since the Creator has given us His eyewitness testimony of creation in the form of the Bible, we would be wise to begin our investigation of origins with a thorough understanding of His Word.

Article taken from *Creation Research Society Quarterly*, "A Demonstration of the Mixing Model to Account for Rb-Sr Isochrons" by Dr. Larry Helmick and Dr. Donald Baumann.



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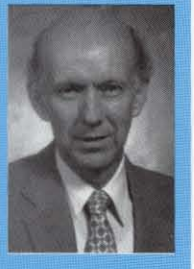


Donald Baumann is a professor of biology and chemistry at Cedarville College and teaches the *Radiation Biology* course. He earned a Ph.D. from Iowa State University and has been at Cedarville since 1964.

DEMONSTRATION
Is Radiometric Dating Valid?

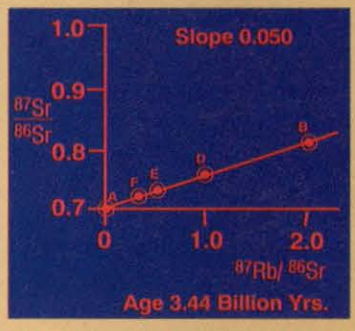
In our *Origins* course at Cedarville College, we perform a demonstration of the isochron method of radiometric dating. We use a bag with various colored beads to represent the mixture of elements within a rock. By pulling beads from the bag, students can take a "rock sample" and calculate the age of the rock. The following description shows the possible outcomes of the demonstration and reveals the inconsistency of radiometric dating.

Three individual rocks (A,B,C) with different concentrations of elements and isotopes are partially mixed by melting to form one larger rock (X). Eleven samples (A-K) are taken from various locations in rock X for analysis. Since rock X is not homogeneous, the eleven samples will contain various ratios of the original three rocks, as shown in Table 1. The isotopic composition of each of the 11 samples is also given in Table 1.

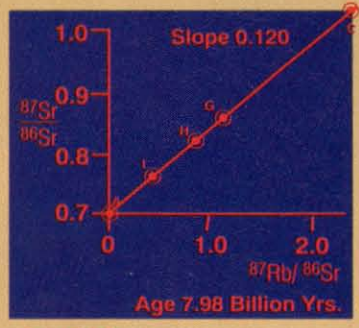
Four or five data points are arbitrarily selected and plotted, as shown in Graphs 1-4. These four graphs reveal four different results from radiometric dating of the same rock using the isochron method.

The four graphs clearly show that there is a problem with radiometric dating using the isochron method.

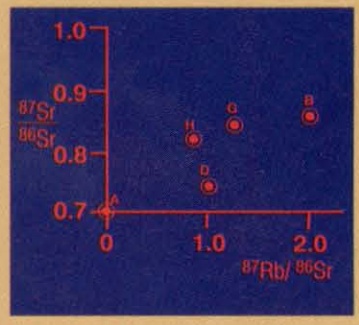
Graph 1:
The ratios of the different isotopes yield an isochron (a straight line), which appears to verify the validity of the data, and an age has been calculated from the slope of the line.



Graph 2:
Plotting a different combination of data from the same rock provides another isochron, but with a different slope and thus a different age. Can the same rock have two different ages?



Graph 3:
The data points are scattered. Therefore, the data appears to be invalid and no line can be drawn.



Graph 4:
The data produces a line with a negative slope, and therefore a negative age! Can a rock have a negative age?

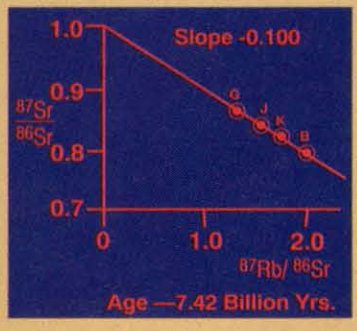


TABLE 1: ISOTOPIC COMPOSITION OF 11 SAMPLES OF ROCK X

Rock Sample	Formed by Mixing	Number of Atoms ^{87}Sr	^{86}Sr	^{87}Rb	$\frac{^{87}Sr}{^{86}Sr}$	$\frac{^{87}Rb}{^{86}Sr}$
A		7	10	0	0.70	0.00
B		8	10	20	0.80	2.00
C		12	12	30	1.00	2.50
D	1A+1B+0C	15	20	20	0.75	1.00
E	2A+1B+0C	22	30	20	0.73	0.67
F	4A+1B+0C	36	50	20	0.72	0.40
G	1A+0B+1C	19	22	30	0.86	1.36
H	2A+0B+1C	26	32	30	0.81	0.94
I	6A+0B+1C	54	72	30	0.75	0.42
J	1A+1B+1C	27	32	50	0.84	1.56
K	1A+4B+1C	51	62	110	0.82	1.77

Is it possible that the 4.5 billion-year age for the earth is simply the result of faulty analysis of isotopic data and that the earth is really not that old? Read the accompanying article for another analysis and explanation of the isotopic data which has been largely ignored by "old earth" scientists because it does not fit their preconceived ideas concerning the age of the earth.